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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 9559WO/HF	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2004/000984	International filing date (<i>day/month/year</i>) 17.06.2004	Priority date (<i>day/month/year</i>) 11.07.2003
International Patent Classification (IPC) or national classification and IPC H01B 17/26		
Applicant ABB RESEARCH LTD. et al		

1.	This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2.	This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.
3.	This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>3</u> sheets, as follows: <div style="margin-left: 20px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</div> b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4.	This report contains indications relating to the following items: <div style="margin-left: 20px;"><input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application</div>

Date of submission of the demand 07.02.2005	Date of completion of this report 26.09.2005
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000984

Box No. 1 Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1 - 10 as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 11 - 13 received by this Authority on 19.06.2005
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 1 - 3 as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-17</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	<u>1-17</u>	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	<u>1-17</u>	YES
	Claims	_____	NO

2. Citations and explanations (Rule 70.7)

The invention

The claimed invention concerns a bushing. The function of a bushing is to carry current through a barrier, such as a wall. A bushing comprises a central conductor surrounded by a dielectric medium. Furthermore, an insulating core built up around a central tube may be included.

Moisture may be absorbed into the core.

This invention is aimed to solve this problem. The solution is that at least a part of the insulating core comprises a diffusion barrier.

Cited documents

These documents are cited in the International Search Report. The citations are considered to describe the most relevant prior art:

D1) PATENT ABSTRACTS OF JAPAN vol. 199, no. 710, 31 October 1997 (1997-10-31) & JP 9153315 A, (NGK INSULATORS LTD) 10 June 1997 (1997-06-10) abstract

D2) US 4500745 A:

An insulating tube (3) is already known from D1. The tube (3) comprises a hollow core cylinder (1) and an outer covering (2). There is also a metallic seal part attached to an end part of the core cylinder (1).

.../...

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

The object of this invention is to prevent infiltration of water and moisture.

A bushing according to the state of the art is described in D2. The bushing (10) comprises a conducting rod (20) and the rod is surrounded by a core (30). The core (30) is made up of sheets of metal foils (26) and paper (28) (fig. 1 & column 2, line 33-column 4, line 13). The paper sheets (28) are saturated with epoxy.

Analysis*Claim 1*

D1 is cited in the International Search Report as a document of particular relevance and is now considered to show the closest background art. The reason for this review is that amended claim 1 of June 19, 2005, now describes that the insulating core comprises a diffusions barrier comprising a continuous film

These features are not revealed in D1. Consequently, D1 does not anticipate the technique of claim 1.

The bushing according to amended claim 1 is considered to give rise to an unexpected technical effect, i.e. the water or moisture is not absorbed by the insulating core in the bushing. Thus, this claim is not considered to describe a technique that is obvious to a person skilled in the art.

Claim 11

The independent and amended claim 11 reveals the same essential features as those according to claim 1.

Conclusion

In accordance with the arguments stated above, the invention in claims 1-17 is novel, considered to involve an inventive step and has industrial applicability.

CLAIMS

1. A bushing for an electrical device, comprising an insulating core (1, 7, 9), **characterized** in that at least a part of the insulating core (1, 7, 9) comprises a continuous diffusion barrier (2, 8) comprising a continuous film with firm adhesion to the insulating core (1, 7, 9).
2. A bushing according to claim 1, **characterized** in that the insulating core (1, 7, 9) is hollow and that at least part of the inside of the insulating core (1, 7, 9) is coated with the diffusion barrier (2, 8).
3. A bushing according to any of the preceding claims, **characterized** in that the insulating core (1, 7, 9) comprises a body of epoxy resin impregnated paper.
4. A bushing according to any of the preceding claims, **characterized** in that an outer hollow insulator (10) is arranged outside the insulating core (1, 7, 9), and that at least a part of the outer hollow insulator (10) is coated with the diffusion barrier (11, 12).
5. A bushing according to any of the preceding claims, **characterized** in that essentially the whole surface of the outer hollow insulator (10) is coated with the diffusion barrier (11, 12).
6. A bushing according to any of the preceding claims, **characterized** in that the diffusion barrier (2, 8, 11, 12) comprises at least one of the following; an inorganic film, an organic film or an organic/inorganic hybrid film.
7. A bushing according to any of the preceding claims, **characterized** in that the diffusion barrier (2, 8, 11, 12) comprises a multi-layer film.

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8. A bushing according to any of the preceding claims, **characterized** in that the diffusion barrier (2, 8, 11, 12) comprises particles of hybrid or inorganic nature.
- 5 9. A bushing according to any of the preceding claims, **characterized** in that the diffusion barrier (2, 8, 11, 12) has a coefficient of water permeability smaller than $0,1 \text{ g.m}^{-2}.\text{day}^{-1}$.
- 10 10. A bushing according to any of the preceding claims, **characterized** in that the diffusion barrier (2, 8, 11, 12) is deposited on at least part of the insulating core (1, 7, 9) and/or the outer hollow insulator (10) by one of the following methods; dipping, painting, spraying, plasma arc, sol-gel
15 technology, Physical Vapor Deposition (PVD) or Chemical Vapor Deposition (CVD).
11. A method for manufacturing a bushing for an electrical device, the bushing comprising an insulating core (1, 7, 9),
20 **characterized** in coating at least a part of the insulating core (1, 7, 9) with a continuous diffusion barrier (2, 8) comprising a continuous film with firm adhesion to the insulating core (1, 7, 9).
- 25 12. A method according to claim 11, **characterized** in that the insulating core (1, 7, 9) is hollow, and in coating at least part of the inside of the insulating core (1, 7, 9) with the diffusion barrier (2, 8)
- 30 13. A method according to any of claims 11-12, **characterized** in arranging an outer hollow insulator (10) outside the insulating core (1, 7, 9), and coating at least a part of the outer hollow insulator (10) with the diffusion barrier (11, 12).

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14. A method according to any of claims 11-13, **characterized** in coating essentially the whole surface of the outer hollow insulator (10) with the diffusion barrier (11, 12).
- 5 15. A method according to any of claims 11-14, **characterized** in coating the insulating core (1, 7, 9) and/or the outer hollow insulator (10) with the diffusion barrier (2, 8, 11, 12) comprising at least one of the following; an inorganic film, an organic film or an organic/inorganic hybrid film.
- 10 16. A method according to any of claims 11-15, **characterized** in coating the insulating core (1, 7, 9) with a diffusion barrier (2, 8, 11, 12) comprising a multi-layer film.
- 15 17. A method according to any of claims 11-16, **characterized** in depositing the diffusion barrier (2, 8, 11, 12) on at least part of the insulating core (1, 7, 9) and/or the outer hollow insulator (10), by one of the following methods; painting, dipping, spraying, plasma arc, sol-gel technology, Physical
20 Vapor Deposition (PVD) or Chemical Vapor Deposition (CVD).